SEW EURODRIVE

CANopen UFO11A Fieldbus Interface

Edition

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Manual

1054 1217 / EN

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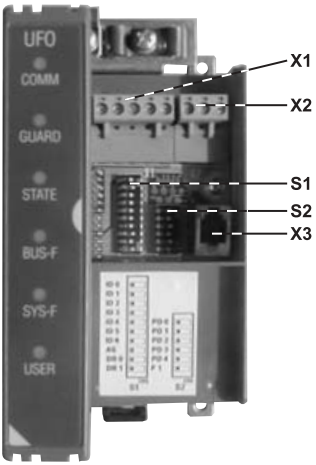
Startup of UFO11A fieldbus interface:

- without PC: section 2
- with PC: section 3

1 Unit Structure

1.1 Front view



05790AXX

Fig. 1: Arrangement of LEDs, connectors and DIP switches

X1	CANopen and electrical power supply
X2	SBus
X3	Diagnostic interface
S1	DIP switch
S2	DIP switch
COMM	Communication on the CANopen interface
GUARD	Status display for timeout on the CANopen bus
STATE	CANopen operating status of the UFO11
BUS-F	Bus fault on the CANopen interface
SYS-F	System fault
USER	Expert mode

2 Installation and Operation without a PC

2.1 Installation notes

Mounting

The unit can be mounted using the pre-installed DIN rail mounting option or directly onto a switch cabinet wall using the four holes integrated into the back wall of the housing. Basically, there are no restrictions regarding positioning in relation to the inverters to be connected (e.g. MOVITRAC® 07). In laying out the system, consider the maximum cable length and the fact that the gateway must be the first or last node on the system bus (SBus).

Pin assignment

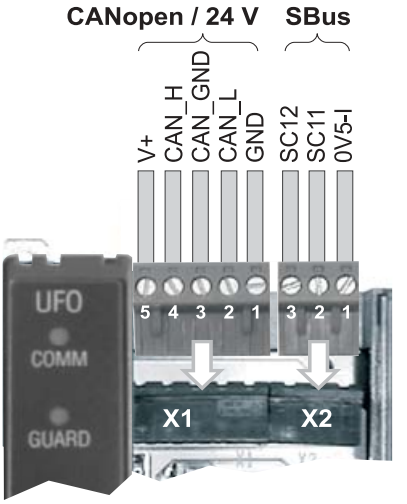


Fig. 2: Pinout

Supply voltage	CANopen	SBus
X1:5: V+	X1:4: CAN_H	X2:3: SC12
X1:1: GND	X1:3: CAN_GND	X2:2: SC11
	X1:2: CAN_L	X2:1: 0V5-I

System bus connection

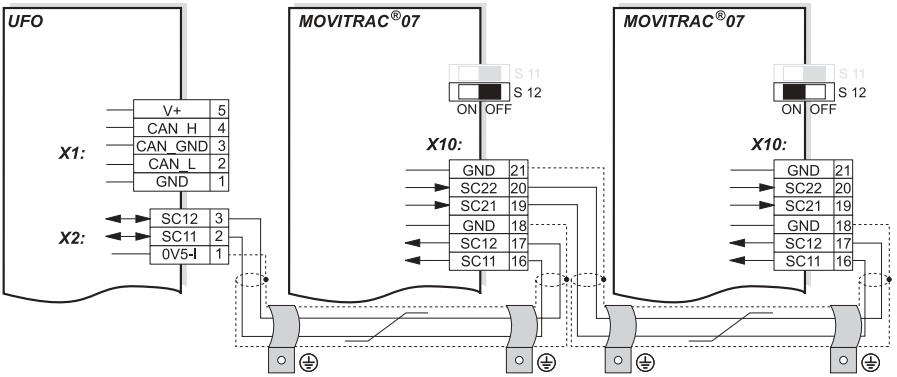


Fig. 3: System bus connection

UFO11A
V+ = Supply voltage
CAN_H = CAN bus high
CAN_GND = CAN bus reference
CAN_L = CAN bus low
0V5-I = System bus reference
SC11 = System bus high
SC12 = System bus low

MOVITRAC® 07
GND = System bus reference
SC22 = System bus outgoing low
SC21 = System bus outgoing high
SC12 = System bus incoming low
SC11 = System bus incoming high
S12 = System bus terminating resistor

Please note:

- Use a 2-core twisted and shielded copper cable (data transmission cable with braided copper shield). Connect the shield at either end to the electronics shield clamp of MOVITRAC® 07 or the UFO11A and also connect the ends of the shield to GND/0V5-I. The cable must meet the following specifications (CAN bus or DeviceNet cables are suitable, for example):
  - Conductor cross section 0.75 mm^2 (AWG18)
  - Cable resistance 120 Ω at 1 MHz
  - Capacitance per unit length ≤ 40 pF/m (12 pF/ft) at 1 kHz
- The permitted total cable length depends on the baud rate setting of the SBus:
  - 125 kbaud: 320 m (1056 ft)
  - 250 kbaud: 160 m (528 ft)
  - 500 kbaud: 80 m (264 ft)
  - 1000 kbaud: 40 m (132 ft)

- Switch on the system bus terminating resistor (S12 = ON) of the node end of the system bus. Switch off the terminating resistor on the other units (S12 = OFF). The UFO11A gateway must always be the first or last node on the system bus. It has an integrated terminating resistor.
- There must not be any potential difference between the units connected to the SBus. Take suitable measures such as connecting each unit's ground lug to a central grounding point in the cabinet to avoid potential differences.
- Point-to-point cabling is not permitted.

Shielding and routing of the bus cables

The CANopen interface supports RS-485 transmission technology and requires the cable type A to EN 50170 specified as the physical medium for CANopen. This cable must be a shielded, twisted-pair two-core cable.

In practice, cables such as the Unitronic BUS CAN 2 × 2 × 0.22 made by Lapp have proven effective even under harsh conditions. The CAN signals are carried along one pair of conductors. The other pair of conductors is used for CAN ground and any supply voltage which is also carried. Yellow – CAN high / Green – CAN low / Brown – CAN GND.

This setup offers the advantage that the necessary compensating current of the bus drivers does not have to be carried along the shield. As a result, no parasitic EMC interference is carried into the shield and ultimately the electronics.

Having the bus cable correctly shielded cuts out parasitic interference which can occur in an industrial environment. The following measures ensure the best possible shielding:

- Finger-tighten the retaining screws of plugs, modules and equipotential bonding conductors.
- Use only connectors with a metal housing or a metallized housing.
- Maximize the contact area between the shield and the connector housing.
- Shield the bus cable on both ends.
- Do not route the signal and bus cables in parallel with the power cables (motor leads); use separate cable ducts if possible.
- Use only grounded metal cable trays in industrial environments.
- Join the signal cables and the associated equipotential bonding together at closely spaced intervals by the shortest route.
- Avoid using plug connections to extend bus cables.
- Route the bus cables closely adjacent to available grounding surfaces.

In the event of fluctuations in the ground potential, a compensating current may flow along the shield which is connected at both ends and to the ground potential (PE). In this case, make adequate provision for equipotential bonding in accordance with the relevant VDE regulations.

Bus termination

No bus termination is provided on the UFO electronics. External bus termination must be used if the UFO module is used as the first or last unit in the CANopen branch. To do this, connect the supplied 120 Ω resistor between CAN high and CAN low (terminals X1:2 and X1:4) as well.

2.2 Setting the inverter parameters (MOVITRAC® 07)

- Switch on the voltage supply for the UFO and all connected inverters.
- Set an individual SBus address (P813) on the inverters. Recommendation: Assign the addresses starting from address 1 and working in ascending order according to the arrangement of inverters in the switch cabinet. Do not assign address 0 since this is used by the UFO.
- Set the setpoint source (P100) to SBus (value 10 on MOVITRAC® 07).
- Set the control signal source (P101) to SBus (value 3 on MOVITRAC® 07).
- Set the terminal assignment of the binary inputs (P60-). Set unrequired binary inputs to "No function." For safety reasons, the inverter must be enabled on the terminal side. Refer to the appropriate unit documentation for information about this. For MOVITRAC® 07, parameter P60- can be set to the value 0. This corresponds to the following assignment:
  - DI01 CW/STOP (applied to 24 V, enable CW direction of rotation)
  - DI02 CCW/STOP (no function)
  - DI03 FIX SETPT SW.OV (not connected)
  - DI04 n11/n21 (not connected)
  - DI05 n12/n22 (not connected)
- Set the SBus timeout delay (P815) to a value other than 0, for example 1 s, to activate the monitoring process.
- If necessary, change the default values of the process data assignments (P870 – P875). This step must be performed before Autosetup (see Sec. "Autosetup").

2.3 Autosetup

You can start up the UFO without a PC with the Autosetup function. It is activated with the Autosetup DIP switch. Turning on the Autosetup DIP switch will execute the function once. The function can be executed once again by turning the switch off and on again. Upon activation of the Autosetup feature, the UFO automatically searches for inverters on the lower-level SBus and indicates this activity with a brief blinking of the SYS-F LED. Each drive inverter on the SBus must be assigned a unique SBus address (P813). To avoid confusion with data assignments, it is recommended to assign the addresses from address 1 and working in ascending order according to the arrangement of inverters in the control cabinet. The process image on the fieldbus side will be extended by three words for each located inverter. The SYS-FLT LED stays on if no drive inverters are found. A maximum of eight inverters can be configured. Following the search, the UFO cyclically exchanges three process data words with each connected drive inverter. The process output data are collected from the fieldbus, divided into blocks of three and sent. The process input data are read by the drive inverters, assembled and sent to the fieldbus master.

Autosetup has to be executed only once. The detected configuration will be saved in the non-volatile memory. Important: Execute Autosetup again in case you change the process data assignment of the drive inverters connected to the UFO, because the UFO saves these values once only during Autosetup. Likewise, the process data assignments of the connected drive inverters must not be altered dynamically either, for example by an IPOS program, following Autosetup. Failure to comply with this instruction could prevent a fault response if there is a fieldbus timeout.

2.4 Setting the UFO DIP switches

- For project planning, set an individual CANopen address using the DIP switches on the UFO (see Sec. "DIP Switches"). Address 0 is not permitted in CANopen.
- Set the DIP switches for the number of process data items (see Sec. "DIP Switches"). The following applies: Number of process data items = Number of connected inverters times 3.
- Set the DIP switch for the baud rate of the CANopen bus (see Sec. "DIP Switches").

Changes to the DIP switches do not come into effect until the UFO has been switched off and on.

3 Installation and Operation with a PC

3.1 Installation notes

Mounting

The unit can be mounted using the pre-installed DIN rail mounting option or directly onto a switch cabinet wall using the four holes integrated into the back wall of the housing. Basically, there are no restrictions regarding positioning in relation to the inverters to be connected (e.g. MOVITRAC® 07). In laying out the system, consider the maximum cable length and the fact that the gateway must be the first or last node on the system bus (SBus).

Pin assignment

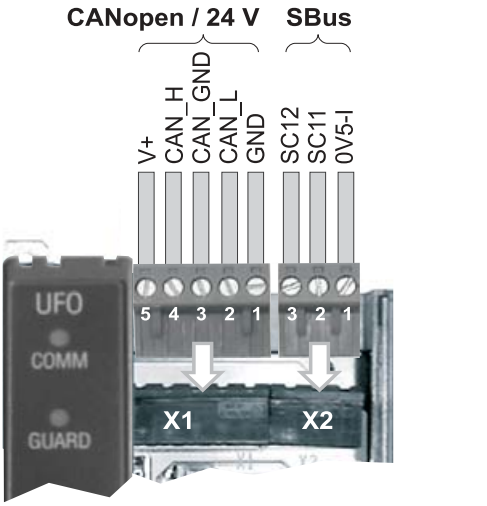


Fig. 4: Pinout

Supply voltage
- X1:5: 24 V_{DC}
- X1:1: 0 V_{DC}

CANopen
- X1:4: CAN H
- X1:3: CAN GND
- X1:2: CAN L

SBus
- X2:3: SC12
- X2:2: SC11
- X2:1: 0V5-I

System bus connection

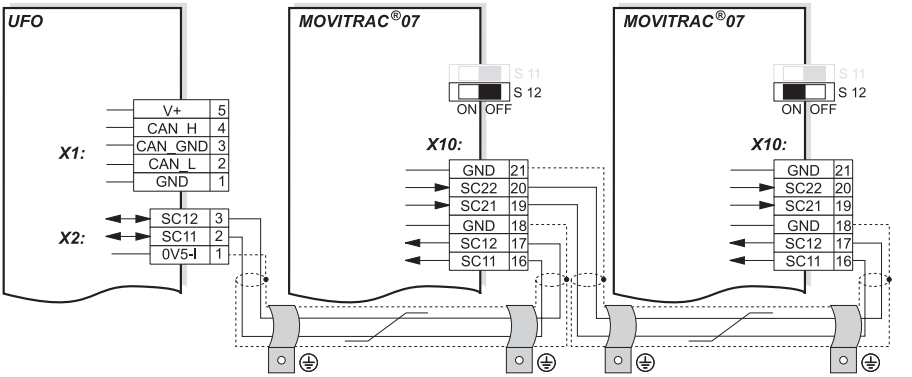


Fig. 5: System bus connection

UFO11A
V+ = Supply voltage
CAN_H = CAN bus high
CAN_GND = CAN bus reference
CAN_L = CAN bus low
0V5-I = System bus reference
SC11 = System bus high
SC12 = System bus low

MOVITRAC® 07
GND = System bus reference
SC22 = System bus outgoing low
SC21 = System bus outgoing high
SC12 = System bus incoming low
SC11 = System bus incoming high
S12 = System bus terminating resistor

Please note:

- Use a 2-core twisted and shielded copper cable (data transmission cable with braided copper shield). Connect the shield at both ends to the electronics shield clamp of MOVITRAC® 07 or the UFO11A and ensure a large area of contact between the shield and the clamp. Also connect the ends of the shield to GND/0V5-I. The cable must meet the following specifications (CAN bus or DeviceNet cables are suitable):
  - Core cross section 0.75 mm^2 (AWG18)
  - Cable resistance 120 Ω at 1 MHz
  - Capacitance per unit length ≤ 40 pF/m (12 pF/ft) at 1 kHz
- The permitted total cable length depends on the baud rate setting of the SBus:
  - 125 kbaud: 320 m (1056 ft)
  - 250 kbaud: 160 m (528 ft)
  - 500 kbaud: 80 m (264 ft)
  - 1000 kbaud: 40 m (132 ft)

- Switch on the system bus terminating resistor (S12 = ON) at the end of the system bus. Switch off the terminating resistor on the other units (S12 = OFF). The UFO11A gateway must always be the first or last node on the system bus. It has an integrated terminating resistor.
- There must not be any potential difference between the units connected to the SBus. Take suitable measures such as connecting each unit's ground lug to a central grounding point in the cabinet to avoid potential differences.
- Point-to-point cabling is not permitted.

Shielding and routing of the bus cables

The CANopen interface supports RS-485 transmission technology and requires the cable type A to EN 50170 specified as the physical medium for CANopen. This cable must be a shielded, twisted-pair two-core cable.

In practice, cables such as the Unitronic BUS CAN 2 × 2 × 0.22 made by Lapp have proven effective even under harsh conditions. The CAN signals are carried along one pair of conductors. The other pair of conductors is used for CAN ground and any supply voltage which is also carried. Yellow – CAN high / Green – CAN low / Brown – CAN GND.

This setup offers the advantage that the necessary compensating current of the bus drivers does not have to be carried along the shield. As a result, no parasitic EMC interference is carried into the shield and ultimately the electronics.

Having the bus cable correctly shielded cuts out parasitic interference which can occur in an industrial environment. The following measures ensure the best possible shielding:

- Finger-tighten the retaining screws of plugs, modules and equipotential bonding conductors.
- Use only connectors with a metal housing or a metallized housing.
- Maximize the contact area between the shield and the connector housing.
- Shield the bus cable on both ends.
- Do not route the signal and bus cables in parallel with the power cables (motor leads); use separate cable ducts if possible.
- Use only grounded metal cable trays in industrial environments.
- Join the signal cables and the associated equipotential bonding together at closely spaced intervals by the shortest route.
- Avoid using plug connections to extend bus cables.
- Route the bus cables closely adjacent to available grounding surfaces.

In the event of fluctuations in the ground potential, a compensating current may flow along the shield which is connected at both ends and to the ground potential (PE). In this case, make adequate provision for equipotential bonding in accordance with the relevant VDE regulations.

Bus termination

No bus termination is provided on the UFO electronics. External bus termination must be used if the UFO module is used as the first or last unit in the CANopen branch. To do this, connect the supplied 120 Ω resistor between CAN high and CAN low (terminals X1:2 and X1:4) as well.

UWS21A

- The UFO is equipped with a 4-pol phone jack on its front panel. The UWS21A option with part no. 8230773 establishes the connection to a COM interface on your PC. Connect the desired COM of the PC with the UWS21A via the enclosed serial cable. Connect the UWS21A to the UFO using the supplied phone cable.

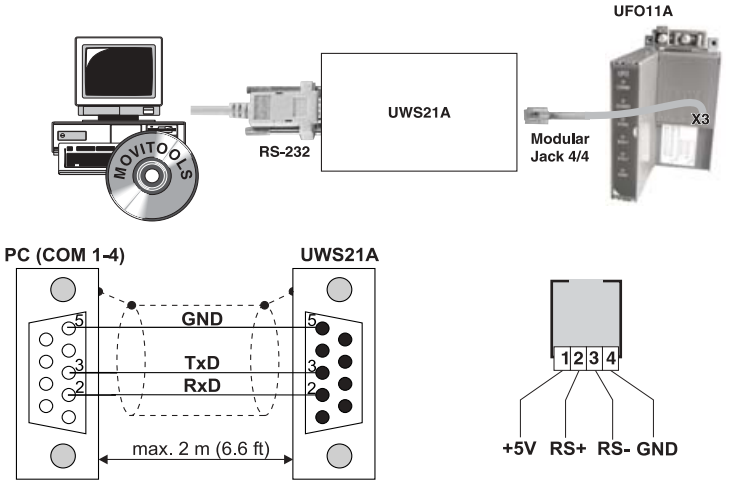


Fig. 6: UWS connection

3.2 Setting the inverter parameters (MOVITRAC® 07)

- Switch on the voltage supply for the UFO and all connected inverters.
- Set an individual SBus address (P813) on the inverters. Recommendation: Assign the addresses starting from address 1 and working in ascending order according to the arrangement of inverters in the switch cabinet.

Do not assign address 0 since this is used by the UFO!

3.3 Startup software

- Install the MOVITOOLS® software package on your PC.
- Start the software. Select the COM port to which the UFO is connected and press the "Update" button. The UFO should appear at address 0 and the connected inverters on the following addresses. In case you do not see an entry in the window, please check the COM interface and the connection via the UWS21. If you only see the UFO as an entry in the window, please check the SBus cabling and the terminating resistors.
- Select the UFO and start the startup software for the fieldbus gateway.
- Select the menu item "New configuration of fieldbus node."
- Enter your project path and name. -> Next
- Press the "Update" button. You should now see all inverters connected to the UFO. You can customize the configuration with the "Insert", "Edit" and "Delete" buttons. -> Next
- Press the "Autoconfiguration" button. You will now see the process image for the UFO in your control. The process data length is displayed at the bottom. This value is important for configuration of the fieldbus master. -> Next
- Save the project data and click the "Download" button. If you experience problems with the download, you have probably set the DIP switch to AUTOSETUP. You need to turn off the autosetup feature when configuring with a PC.
- You can see the data being exchanged between fieldbus master and UFO with the process data monitor.
- You will have to enable the unit via the terminals to control the inverters via fieldbus. You have already connected the terminals DI01 and DI02 (MOVITRAC® 07). Select the first inverter with address 1 in the window "Connected units" to check the pinout.
- Repeat this step for all inverters listed in the window "Connected units."

3.4 Setting the UFO DIP switches

- For project planning, set an individual CANopen address using the DIP switches on the UFO (see Sec. "DIP Switches"). Address 0 is not permitted in CANopen.
- Set the DIP switches for the number of process data items (see Sec. "DIP Switches"). The following applies: Number of process data items = Number of connected inverters times 3.
- Set the DIP switch for the baud rate of the CANopen bus (see Sec. "DIP Switches").

Changes to the DIP switches do not come into effect until the UFO has been switched off and on.

4 CANopen Interface

4.1 Configuring the CANopen interface

General features of the CANopen interface of the UFO:

- 0 to 8 RX PDOs
- 0 to 8 TX PDOs
- Various transmission modes for the PDOs
- Length of the PDOs can be configured dynamically
- 1 SDO
- Emergency message
- COB IDs for SYNC, emergency and PDOs can be configured dynamically.
- Heartbeat producer & consumer
- Guarding protocol

Unit states and NMT services

The UFO supports what is referred to as the "minimum capability device". This means the following states are supported: "pre-operational", "operational" and "prepared". In "pre-operational" status, the device can only communicate via SDOs (see also Sec. "CANopen Interface" / "Parameter access via SDOs"). PDOs and SDOs can be exchanged in "operational" status; neither SDOs nor PDOs can be exchanged in "stopped" status.

Following switch-on, the CANopen option card is always automatically in the "pre-operational" status.

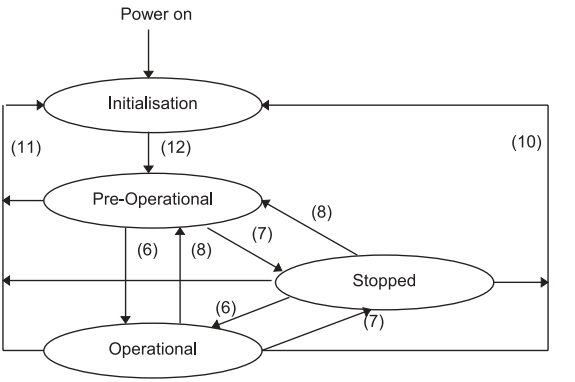


Fig. 7: Status diagram for CANopen devices

The states can be changed at any time by services referred to as NMT services.

The possible commands in this case are:

- (6) Node_Start indication
- (7) Node_Stop indication
- (8) Enter_Pre-Operational_State indication
- (10) Reset_Node indication: This command resets the entire inverter and the UFO activates the default settings in the object list.
- (11) Reset_Communication: This command triggers a reset of the communication parameters in the object list.
- (12) Initialization complete – automatically changes to "pre-operational"

The CAN respective telegrams have the following structure:

NMT service	COB ID	Byte 1	Byte 2
Node_Start	0x0000	0x01	Node ID
Node_Stop	0x0000	0x02	Node ID
Enter_Pre-Operational_State	0x0000	0x80	Node ID
Reset_Node	0x0000	0x81	Node ID
Reset_Communication	0x0000	0x82	Node ID

In this case, node ID corresponds to the address set in the DIP switches (see Sec. "DIP Switches"). In addition, the value "0" is permitted for the node ID here; in this case, all CANopen devices are addressed.

NMT services are not confirmed by the slave.

Process data exchange

Up to 8 inverters can be connected to the gateway. A maximum of 3 process words (process output data items, PO for short) are sent from the UFO to each inverter and 3 process input words (PI for short) are sent from each inverter to the UFO. This means the UFO is provided with a 24 word process data buffer (48 bytes) for the POs and a 24 word buffer for the PIs.

The buffer for the POs is located at index 15800 ... 15823 (subindex 0) and the buffer for the PIs at index 15900 ... 15923 (subindex 0).

RX PDOs can be written to the PO buffer by the control. A maximum of 4 words can be transmitted by each PDO in the CANopen profile. This means at least 6 RX PDOs are necessary to transmit 24 process data items from the control to the UFO.

However, a maximum of 4 default RX PDOs are defined in CANopen DS301 V4.02. You can assign the COB IDs of the PDOs dynamically from the control to avoid conflicts with the COB IDs on the CANopen bus.

In addition, it may be desirable under special circumstances for the 24 process data items to be transmitted with mutual or partially mutual consistency. Consistent transmission can be achieved using a SYNC telegram and by configuring the corresponding RX PDOs to "SYNC" transmission mode.

It is possible to send process data subject to event control, which means only whenever they have changed. This is done to reduce bus traffic and to avoid having to transmit 24 PDs cyclically.

Up to 8 RX PDOs are provided in the UFO to transmit the POs for each connected inverter in a separate RX PDO. The length of an RX PDO can be adapted if only 1 PO (control word) is sent to the inverter instead of 3 POs.

It goes without saying that the TX PDOs can be configured in the same way as the RX PDOs described above.

Configuration of the COB IDs

In its initializing status, the UFO defines the COB IDs according to the settings of the DIP switches (see Sec. "DIP Switches").

If more than 4 PDOs are activated with the DIP switches, the UFO also uses the default COB IDs of the CANopen slave address 64 + (own slave address).

If only slaves with addresses < 65 are connected to the CANopen bus, no bus conflicts can occur, even when 8 RX and 8 TX PDOs are used. If the system contains slaves with addresses > 64, an individual check must be made to see whether the COB IDs need to be changed by the CANopen master.

The COB IDs should be changed in the pre-operational unit status (see Sec. "CANopen Interface"). Although it is also possible to change the COB IDs in the operational status, the CAN controller is temporarily separated from the bus. This means process data losses may occur in the operational status.

The COB IDs for TX PDO1..8 can be changed using object 1800(hex) – 1807(hex), subindex 1.

The COB IDs for RX PDO1..8 can be changed using object 1400(hex) – 1407(hex), subindex 1. This is a 32-bit word. Its basic structure is explained in the tables "Structure of the PDO COB ID entry" and "Description of the PDO COB ID entry."

Identifier range 0 ... 28 can only be changed if bit 31 is set at the same time (COB ID invalid). New values are only accepted in the identifier range if they have an 11-bit ID (i.e. bit 29 is never allowed to be set) and if the ID has not already been assigned to another PDO or the emergency object (see Sec. "CANopen Interface" / "Emergency object").

In TX PDOs, bit 30 (RTR not allowed) must always be 0 and it must always be set in RX PDOs.

Structure of the PDO COB ID entry

	UNSIGNED32				
	MSB				LSB
Bits	31	30	29	28 ... 11	10 ... 0
11-bit ID	0/1	0/1	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	11-bit identifier
29-bit ID	0/1	0/1	1	29-bit identifier	

Description of the PDO COB ID entry

Bits	Value	Meaning
31 (MSB	0	PDO exists / is valid
	1	PDO does not exist / is not valid
30	0	RTR allowed in this PDO
	1	RTR not allowed in this PDO
29	0	11-bit ID (CAN 2.0A)
	1	29-bit ID (CAN 2.0B)
28 ... 11	0	If bit 29 = 0
	X	If bit 29 = 1: Bits 28 ... 11 of 29-bit COB ID
10 ... 0 (LSB)	X	Bits 10 ... 0 of COB ID

Changing the PDO length

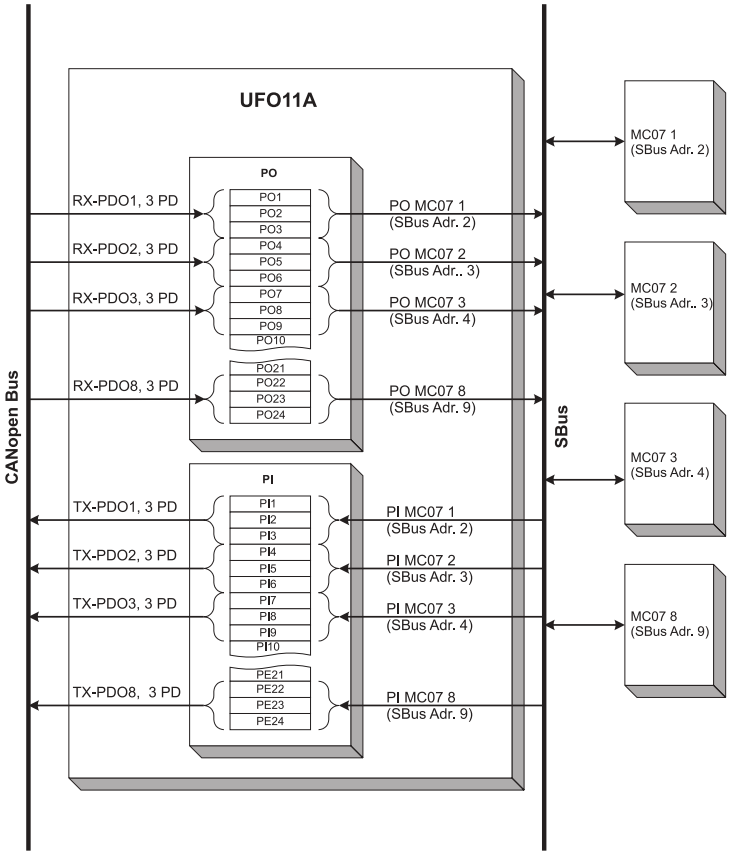


Fig. 8: Standard division of the UFO process data buffer

In initializing status, the UFO specifies the mapping and the length of all TX and RX PDOs as 3 process data items.

The number of process data items in the PDOs should be changed in the pre-operational unit status (see Sec. "CANopen Interface"). Although it is also possible to make such changes in the operational status, the CAN controller is temporarily separated from the bus. This means process data losses may occur in the operational status.

Fig. 8 shows the classic division of the process data buffer in the UFO following an Autosetup (see Sec. "Installation and Operation without a PC" / "Autosetup"). The number of process data items which are transmitted in a PDO and the number of process data items which are transmitted to the corresponding inverter via the SBus are completely independent of one another. When Autosetup is selected, 3 POs and 3 PIs are always provided on the SBus for each connected inverter. The UFx Configurator makes it possible to set other configurations (see Sec. "Using the Interface"). As a rule, this configuration will enable 90 % of all applications to work satisfactorily.

Fig. 9 illustrates how a control word and the speed are transmitted in an RX PDO using PDO1. In a second RX PDO, the ramp for the inverter with SBus address 2 is transmitted. This method allows a reduced bus traffic if the ramp is to be transmitted much less frequently than the control word and the setpoint speed.

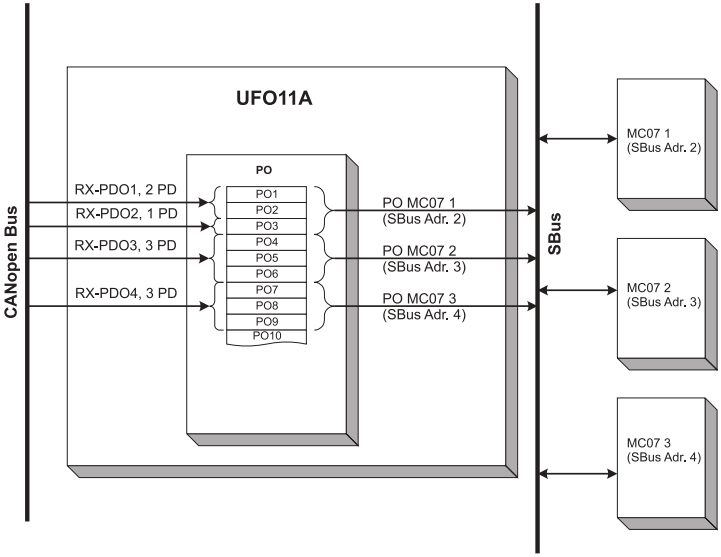


Fig. 9: 2 PDOs for 1 MOVITRAC® 07

Fig. 10 shows a possible configuration in which only two or one process data items are transmitted via the SBus rather than three. RX PDO1 was configured with two process data items and RX PDO2 with one process data item to give a consistent and logical assignment to PDOs.

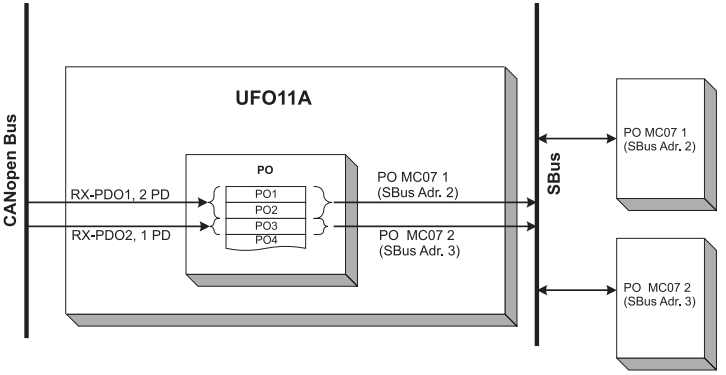


Fig. 10: Consistent assignment of PDOs to the individual inverters

The number of process data items transferred with the individual PDOs is defined for RX PDO1 ... 8 by object 1600(hex) ... 1607(hex), subindex 0 and for TX PDO1 ... 8 with object 1A00(hex) ... 1A07(hex), subindex 0. Possible values are in the range 0 ... 4. 0 corresponds to a PDO which does not transmit any process data, 4 corresponds to a PDO which transmits 4 process data items (8 bytes). The important peripheral condition in this case is that the total of all process data transmitted in RX PDOs is not to exceed 24 and the total of all process data transmitted in the TX PDOs is not to exceed 24. The mapping is automatically recalculated and defined by the UFO. The UFO always assumes that RX PDO1 ... 8 are mapped in succession into the PO buffer and TX PDO1 ... 8 are mapped in succession into the PI buffer.

Transmission mode

It is possible to select from various transmission modes for each TX PDO and for each RX PDO:

TX PDO

The transmission modes for TX PDO1 ... 8 can be changed using object 1800(hex) ... 1807(hex), subindex 2. This is an 8-bit value.

- Event-driven and synchronous (value 0): The corresponding TX PDO is always sent following the next SYNC pulse whenever a process data item has changed.

- Cyclical and synchronous (value 1 ... 240): After every 1st ... 240th SYNC pulse (depending on the value), the TX PDO is sent regardless of whether the content of the TX PDOs has changed or not. Every PDO has transmission mode = 1 after leaving initialized status.
- Proprietary (value 254): For this mode, the corresponding RX PDO must also be set to transmission mode 254. The TX PDO is always sent whenever the corresponding RX PDO is received. In this case, the process data takeover is completely asynchronous, i.e. unrelated to the SYNC pulses. Example: RX PDO2 and TX PDO2 have transmission mode 254. A TX PDO2 is sent immediately after a valid RX PDO2 is received (valid means the length is not too short).
- Event-driven and asynchronous (value 255): Whenever a value of the TX PDO changes, this is sent by the UFO. Warning: This setting results in very considerable bus traffic if the TX PDO is used for sending speed, current, position or other rapidly changing parameters. The inhibit time can be used for restricting the bus traffic deterministically for such TX PDOs.

Transmission modes 241 ... 253 are reserved and cannot be selected.

See Sec. "CANopen Interface" / "SYNC object" for information about the SYNC pulse.

The default setting is 1 (synchronous on each SYNC pulse).

RX PDO

The transmission modes for RX PDO1 ... 8 can be changed using object 1400(hex) ... 1407(hex), subindex 2. This is an 8-bit value.

- Synchronous (value 0 ... 240): The data of the RX PDO are transferred into the PO buffer of the UFO when the next SYNC pulse is received (it does not matter whether the value is 0 or 240). This transmission process allows several PDOs to be sent from the master to the UFO and then transferred into the PO buffer of the UFO using a SYNC pulse at the same time and with mutual consistency.
- Proprietary (value 254): For this mode, the corresponding RX PDO must also be set to transmission mode 254. The TX PDO is always sent whenever the corresponding RX PDO is received. In this case, the process data takeover is completely asynchronous, i.e. unrelated to the SYNC pulses. Example: RX PDO2 and TX PDO2 have transmission mode 254. A TX PDO2 is sent immediately after a valid RX PDO2 is received (valid means the length is not too short).
- Event-driven and asynchronous (value 255): Whenever an RX PDO arrives, it is always accepted and passed on.

Transmission modes 241 ... 253 are reserved and cannot be selected.

See Sec. "CANopen Interface" / "SYNC object" for information about the SYNC pulse.

The default setting is 1 (synchronous on each SYNC pulse).

Inhibit time

The inhibit time is a blocking time for TX PDOs. The inhibit time for a TX PDO starts after the object is sent. The object is not allowed to be sent again on the CANopen bus until the inhibit time has elapsed. The inhibit time is entered in 0.0001 s, i.e. 10000 corresponds to 1 s. The maximum inhibit time is 6.5535 s.

The UFO processes inhibit times with a resolution of 1.0 ms, i.e. the value 15 (corresponding to an inhibit time of 1.5 ms) is treated as 2 ms.

The inhibit time cannot be changed unless the corresponding PDO is marked as "invalid" (index 1800(hex) ... 1807(hex), subindex 1, bit 31 = 1, see Sec. "Configuration of the COB IDs").

4.2 SYNC object

The SYNC object transfers process data of several PDOs into the UFO data buffer or sends them in a mutually consistent way at a defined point in time. All PDOs to be synchronized with the SYNC object have to be operated in transmission mode 0 ... 240. If the transmission mode of a TX PDO is 4, the UFO sends this TX PDO after every 4th SYNC pulse. The situation is different with RX PDOs: These accept the PDO data on every SYNC pulse.

Changing the COB ID of the SYNC object

In initializing status, the UFO defines the COB ID of the SYNC object as 0080 hex.

The COB ID should be changed in the pre-operational unit status (see Sec. "CANopen Interface"). Although it is also possible change the COB ID in the operational status, the CAN controller is temporarily separated from the bus. This means process data losses may occur in the operational status.

The UFO is only a SYNC consumer and only works with 11-bit COB IDs. Consequently, bit 30 and bit 29 must always be 0. The structure of the COB ID and the meaning of the individual bits are explained in the tables "Structure of the SYNC COB ID entry" and "Description of the SYNC COB ID entry".

The COB ID is addressed as unsigned long via index 1005hex, subindex 0.

Structure of the SYNC COB ID entry

	UNSIGNED32				
	MSB				LSB
Bits	31	30	29	28 ... 11	10 ... 0
11-bit ID	X	0/1	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	11-bit identifier
29-bit ID	X	0/1	1	29-bit identifier	

Description of the SYNC COB ID entry

Bits	Value	Meaning
31 (MSB)	X	No influence
30	0	Unit does not generate SYNC message
	1	Unit does generate SYNC message
29	0	11-bit ID (CAN 2.0A)
	1	29-bit ID (CAN 2.0B)
28 ... 11	0	If bit 29 = 0
	X	If bit 29 = 1: Bits 28 ... 11 of 29-bit SYNC COB ID
10 ... 0 (LSB)	X	Bits 10 ... 0 of SYNC COB ID

4.3 Emergency object

The emergency object is always sent once by the UFO when a fault is detected and once again when this fault is no longer present.

The UFO sends an EMCY object in response to the following faults:

- An inverter sets the error bit in its status word.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
10hex	FFhex	Error register (object 1000hex)	0	Status word 1 of the inverter, low	Status word 1 of the inverter, high	0	SBus addr. of the inverter

- The UFO sets the error bit in its status word.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0	FFhex	Error register (object 1000hex)	0	Status word 1 of the UFO, low	Status word 1 of the UFO, high	0	SBus addr. of the inverter

- The inverter is only running in 24 V backup mode, there is no voltage for the rotating field.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0	31hex	Error register (object 1000hex)	0	0	0	0	SBus addr. of the inverter

- The CAN controller has lost telegrams from the CANopen bus because the receive queue has overrun.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
10hex	81hex	Error register (object 1000hex)	0	0	0	0	0

- The CAN controller is in the error-passive status (see Sec. "LEDs" / "BUS-F LED").

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
20hex	81hex	Error register (object 1000hex)	0	0	0	0	0

- The CAN controller was in the bus off status (see Sec. "LEDs" / "BUS-F LED").

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
40hex	81hex	Error register (object 1000hex)	0	0	0	0	0

- The lifeguarding protocol was activated but not served within the timeout time.

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
30hex	81hex	Error register (object 1000hex)	0	0	0	0	0

COB ID of the emergency object

Structure of the identifier entry EMCY

	UNSIGNED32				
	MSB				LSB
Bits	31	30	29	28 ... 11	10 ... 0
11-bit ID	0/1	0	0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	11-bit identifier
29-bit ID	0/1	0	1	29-bit identifier	

Description of the SYNC COB ID entry

Bits	Value	Meaning
31 (MSB	0	EMCY exists / is valid
	1	EMCY does not exist / is not valid
30	0	reserved (always 0)
29	0	11-bit ID (CAN 2.0A)
	1	29-bit ID (CAN 2.0B)
28 ... 11	0	If bit 29 = 0
	X	If bit 29 = 1: Bits 28 ... 11 of 29-bit COB ID
10 ... 0 (LSB)	X	Bits 10 ... 0 of COB ID

In initializing status, the UFO defines the COB ID of the EMCY object as 0080hex + slave address.

The COB ID should be changed in the pre-operational unit status (see Sec. "CANopen Interface"). Although it is also possible to change the COB ID in the operational status, the CAN controller is temporarily separated from the bus. This means process data losses may occur in the operational status.

Bit 29 must always be 0 because the UFO only works with 11-bit COB IDs. The structure of the COB ID and the meaning of the individual bits are explained in the tables "Structure of the EMCY identifier entry" and "Description of the EMCY COB ID entry".

If the UFO is not to send any EMCY object, the EMCY object can be deactivated by setting bit 31 to 1.

The COB ID is addressed as unsigned long via index 1014hex, subindex 0.

Inhibit time of the EMCY object

The inhibit time of the emergency object on the CANopen bus is specified as unsigned16 (2 bytes) via index 1015hex, subindex 0. This value is 0 when the UFO exits initialized status, i.e. there is no inhibit time.

The inhibit time is defined as a multiple of 0.0001 s, i.e. the value 3000 corresponds to an inhibit time of 300 ms.

4.4 Guarding and heartbeat

Lifetime

The UFO supports two kinds of timeout monitoring (nodeguarding). First, the network master can check whether the individual nodes are still ready to operate. To do this, a nodeguarding object with RTR bit set must be sent to the nodes (example for node ID "3"):

If the node is ready, it responds with a corresponding nodeguarding object which returns the current readiness status and a toggle bit:

The toggle bit changes between 0 and 1 with every telegram. The network master can use the response to determine whether the CANopen participants are still in their original status or whether the status has changed due to a fault.

In initializing status, the UFO defines the COB ID for nodeguarding as 0700hex + CANopen address.

In the second type of lifeguarding, the CANopen slaves check their NMT master. It is possible to set a timeout time for this in milliseconds using the indices 0x100C ("guard time") and 0x100D ("lifetime factor"). This timeout time is calculated as the product of lifetime factor and guard time. Timeout times shorter than 5 ms are rejected. The second type of nodeguarding is only active if a timeout time other than 0 is set (i.e. lifetime factor 0 and guard time 0). All process data words in the UFO are set to zero if no node event is triggered by the master within the timeout time.

Refer to the appropriate operating instructions to see how the inverters connected to the UFO via the SBus react to zero value setpoints and control words. Also, an EMERGENCY object is placed on the CAN bus.

The GUARD LED lights up with a steady light to indicate that nodeguarding has been activated.

The timeout time set by the control can be read out from P819 using the diagnostic interface and MOVITOOLS. However, it is not to be changed using MOVITOOLS, but instead only by the control using CANopen objects 0x100C and 0x100D:

Nodeguarding is active in all operating states from the first time a node is received from the master.

Heartbeat

The UFO is a heartbeat producer. The time interval in which heartbeats are produced can be set using index 1017hex, subindex 0 by means of an unsigned16 value. This value corresponds to the heartbeat in ms, i.e. 3000 means that a heartbeat is sent every 3 s. The default value after exiting initialized status is 0, i.e. the heartbeat is deactivated. If the guarding protocol is active, simultaneous use of the heartbeat protocol is not allowed.

The UFO can monitor another heartbeat producer at the same time. An unsigned32 value in index 1016hex, subindex 1 sets the node to be monitored and the monitoring time.

ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x600 + NodeID = 0x603	0x423	0x16	0x10	0x01	Time in ms		0x01 – 0x7F	0x00
ID for SDO	Expedited upload	Index low	Index high	Sub-index	Time low	Time high	Nodes	Re-served

The monitoring time must have a larger value than the time interval set for the heartbeat on the monitored node. If the heartbeat protocol is active then simultaneous use of the lifetime mechanism is not allowed.

4.5 Parameter access via SDOs

SDOs and their services

SDOs (service data objects) are used for setting parameters and reading out the configuration. These SDOs are capable of transmitting large volumes of data, but they are relatively slow. The following services can be applied to the SDOs in order to send SDOs from or to the UFO:

- Multiplexed download domain (write access)
  - Initiate domain download protocol
    - Expedited transfer
    - Normal transfer (data block length > 4 bytes)
- Multiplexed upload domain (read access)
  - Initiate domain upload protocol
    - Expedited transfer
    - Normal transfer (data block length > 4 bytes)
- Abort domain transfer (for any protocol errors that may occur)

The *normal transfer* is only implemented for uploading objects 0x1008 – 0x100A; all others are uploaded using the *expedited transfer* because they are 4 bytes long at most.

The response time to a download or upload is not specified and also depends on the system load, i.e. the bus traffic and the number of incoming PDOs.

Refer to Sec. "Object List" and the MOVIDRIVE® Fieldbus Unit Profile for the parameters, their indices and subindices.

Example: "Device type" read access

In this example, a read access is made to the "Device type" entry in the unit with CANopen address = 3 set on the DIP switches:

ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x600 + NodeID = 0x603	0x40	0x00	0x10	0x00	0x00	0x00	0x00	0x00
ID for SDO	Expedited upload	Index low	Index high	Subindex	Value unimportant			

The control must send an "initiate multiplexed upload domain" protocol for read access.

This protocol provides for all CAN telegrams being 8 bytes long.

The option card responds with:

ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x580 + NodeID = 0x583	0x43[1)]	0x00	0x10	0x00	0x2D	0x01	0x00	0x00
ID for SDO	Expedited upload	Index low	Index high	Sub-index	Re-sponse low	Re-sponse	Re-sponse	Re-sponse high

1) This value only applies to the printed telegram. This value may change depending on the data type in the case of other indices, see CANopen DS301.

Example: Write access

A similar example is the write access to index 0x100C, subindex 0x00 (guard time). This entry is set to the value 10000 ms (0x2710)

The control sends an "expedited download" request first:

ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x600 + NodeID = 0x603	0x2B[1)]	0x0C	0x10	0x00	0x10	0x27	0x00	0x00
ID for SDO	Expedited download	Index low	Index high	Sub-index	Value low	Value high	Filler byte	Filler byte

1) This value only applies to the printed telegram. This value may change depending on the data type in the case of other indices, see CANopen DS301.

The CANopen option card responds if implementation was successful (the CANopen option card checks the index, subindex, write permission, data type and, if necessary, whether the sent value is permitted):

ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x580 + NodeID = 0x583	0x60[1)]	0x00	0x10	0x00	0x00	0x00	0x00	0x00
ID for SDO	Expedited download	Index low	Index high	Sub-index	Value unimportant			

1) This value only applies to the printed telegram. This value may change depending on the data type in the case of other indices, see CANopen DS301.

Incorrect performance of service

The DFO11A sends an abort telegram in case of a fault. The abort telegram contains an error code which describes the cause of the fault.

ID	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0x580 + NodeID = 0x583	0x80	0x00	0x10	0x00				
ID for SDO	SDO abort	Index low	Index high	Sub-index	Add. code low	Add. code high	Error code	Error class

SEW-specific fault codes are described in [Inverter parameter settings] / [Return codes for parameterization] of the MOVIDRIVE® Fieldbus Unit Profile. All other fault codes are specified in the CANopen Communication Profile DS301, Sec. 9.2.2.

Access to SEW unit parameters

The UFO parameters can be accessed using parameter access (from index 206Chex) with subindex 0. The parameters of the inverters connected via the SBus can be accessed using parameter access (from index 206Chex) with subindex ≠ 0. In this case, the subindex should be set to the same value as the SBus address of the connected inverter.

Example: Access index 8300, subindex 0 to read the software version of the UFO.

Access index 8300, subindex 2 to read the software version of the top MOVITRAC® 07 in Fig. 8.

5 Error Response

5.1 Fieldbus timeout

In case the the timeout monitoring has been set and activated for the CANopen fieldbus, switching off the fieldbus master or a wire break in the fieldbus cabling leads to a fieldbus timeout in the UFO. The connected drive inverters are set to a safe status by zeros being sent on the process output data. This corresponds to a rapid stop on control word 1. The fieldbus timeout error is self-resetting, meaning the drive inverters will begin receiving the current process output data from the master immediately after fieldbus communication is re-established. This error response can be deactivated using P831 on the UFO.

5.2 SBus timeout

If one or more inverters on the Sbus can no longer be addressed by the UFO, the UFO enters error code 91, "System error," in status word 1 of the corresponding drive inverter. The SYS-F LED lights up and the error is also displayed via the diagnostic interface. P815 SBus timeout delay must be set to a value other than 0 on the drive inverter if it is to stop. The error is self-resetting on the UFO, meaning the current process data are exchanged again immediately after communication resumes.

5.3 Unit errors

UFO fieldbus interfaces detect a range of hardware defects and respond with an inhibit condition. Refer to the list of errors for the exact error responses and measures to remedy the problem. A hardware defect means error 91 is entered in the process input data of the fieldbus in status word 1 of all drive inverters. The SYS-F LED on the UFO then flashes evenly. The exact error code is displayed in the status of the UFO using the diagnostic interface of MOVITOOLS.

6 LEDs

The UFO CANopen interface has 6 diagnostic LEDs:

- "COMM" LED (green) for displaying module communication
- "LIFE" LED (green/red) for displaying the fieldbus timeouts
- "STATE" LED (green) for displaying the UFO module status
- "BUS-F" LED (red) for displaying bus faults
- "SYS-F" LED (red) for displaying system faults and operating conditions of the UFO
- "USER" LED (green) for application-specific diagnostics in expert mode

6.1 COMM LED

The COMM LED always flashes briefly whenever the UFO has sent a telegram or when the UFO receives a telegram addressed to the UFO.

6.2 GUARD LED

The GUARD LED displays the status of CANopen lifetime monitoring.

LED	Meaning
Off	CANopen timeout monitoring not activated for the UFO (object 0x100C = 0 and/or object 0x100D=0). This is the default setting after switching on the unit.
On	CANopen timeout monitoring activated for the UFO (object 0x100C0 and object 0x100D0).
Flashes green (1 s cycle)	No more lifetime requests have been received by the CANopen master. The UFO is in "fieldbus timeout" status.

6.3 STATE LED

The STATE LED displays the current NMT status of the UFO. The UFO supports minimum boot up, i.e. the states "pre-operational", "operational" and "stopped" exist.

Status	LED	Meaning
Pre-operational	Flashes (1 s cycle)	Only the unit parameters can be set (with SDOs); process data (PDOs) are ignored. This status is adopted after switching on the unit.
Operational	On	PDOs, SDOs and NMT services are processed.
Stopped	Off	The unit ignores all SDOs and PDOs. Only NMT telegrams are still processed.

6.4 BUS-F LED

The BUS-F LED displays the physical status of the bus node.

Status	LED	Meaning
Error-active state	Off	The number of bus faults is in the normal range.
Error-passive state	Flashes red (1 s cycle)	The number of physical bus faults is too high. No more error telegrams are actively written to the bus.
BusOff state	Red	The number of physical bus faults has continued to grow despite the switch to the error-passive state. Access to the bus is deactivated. This fault can only be reset by a power-on reset.

6.5 SYS-F LED

OFF	Normal operating status. The UFO is exchanging data with the connected inverters. Pre-requisite: The "STATE" LED must be on.
FLASHES 1 x briefly followed by a long pause	Autosetup has been selected using the DIP switch and the UFO is currently setting up its configuration. Please switch Autosetup off and on again if this status continues for longer than 1 minute. Replace the module if Autosetup does not finish several times in a row.
FLASHES evenly	The UFO is in fault status. If you started up the UFO using the Autosetup DIP switch, please switch the UFO off and on again. If the LED is still on, please restart Autosetup by switching the DIP switch off and on again. If you started up the UFO using MOVITOOLS, a fault message will be displayed in the status window. Please refer to the appropriate fault description.
ON	The UFO is not exchanging data with the connected inverters. Either it has not been configured or the connected inverters are not responding. Reconfigure the UFO. If you started up the UFO using Autosetup, please switch the Autosetup DIP switch off and on again. If the LED stays on after Autosetup, please check the cabling and the terminating resistors of the SBus as well as the inverter voltage supply. If you started up the UFO using MOVITOOLS, please click the "Update" button in the Movitools Manager. All the inverters should be displayed in the "Connected Inverters" window. If this is not the case, please check the cabling and the terminating resistors of the SBus as well as the inverter voltage supply. Reconfigure the UFO with MOVITOOLS if necessary.

6.6 USER LED

Normal operating status; Off. The "USER" LED is reserved for expert mode.

7 DIP Switches

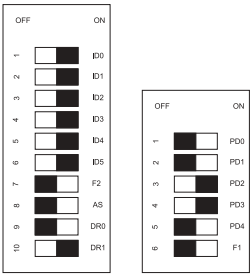


Fig. 11: DIP switches (factory setting)

The factory setting shown in Fig. 11 amounts to the following configuration:

- Baud rate 500 kbaud
- Slave ID 63
- 12 PD (corresponds to 4 default PDOs)
- Autosetup off

7.1 CANopen address

The CANopen address (NodeID) is set using DIP switches ID0 ... ID5. If a DIP switch is "on," its value is 1; if it is "off," its value is 0.

The following formula applies:

CANopen address = ID0 + ID1 * 2 + ID2 * 4 + ID3 * 8 + ID4 * 16 + ID5 * 32

Example For address 27, ID 5 must be off, ID4 on, ID3 on, ID2 off, ID1 on and ID0 on

Important! CANopen address 0 is not permitted. If ID0 ... ID5 are "off", this amounts to an invalid CANopen configuration and the UFO cannot communicate via CANopen. This is indicated by the STATE and GUARD LEDs flashing simultaneously when the UFO is switched on.

7.2 Baud rate of the CANopen bus

The baud rate is set using DIP switches DR0 and DR1.

	DR0	DR1
125 kbaud	Off	Off
250 kbaud	On	Off
500 kbaud	Off	On
1 Mbaud	On	On

7.3 Number of process data items to be transmitted via the CANopen bus

You can use PD0 ... PD4 to determine how many PDOs the UFO makes available after it exits the initializing status. Naturally, this PDO configuration can be overwritten by the CANopen master.

The following table shows the length of the PDOs (in words, i.e. 2 bytes/word) depending on the setting of the DIP switches. Here, PDO refers to both RX and TX PDOs. "NA" stands for "not active", i.e. the COB ID of this PDO is still available for the remainder of the CANopen system.

If a DIP switch is "on," its value is 1; if it is "off," its value is 0. The following formula applies:

Number of PDs = PD0 + PD1 * 2 + PD2 * 4 + PD3 * 8 + PD4 * 16

If the number of PDs > 24 then the number of PDs is assumed to be 24.

No. of PDs	PDO1	PDO2	PDO3	PDO4	PDO5	PDO6	PDO7	PDO8
0	NA	NA	NA	NA	NA	NA	NA	NA
1	1	NA	NA	NA	NA	NA	NA	NA
2	2	NA	NA	NA	NA	NA	NA	NA
3	3	NA	NA	NA	NA	NA	NA	NA
4	3	1	NA	NA	NA	NA	NA	NA
5	3	2	NA	NA	NA	NA	NA	NA
6	3	3	NA	NA	NA	NA	NA	NA
7	3	3	1	NA	NA	NA	NA	NA
8	3	3	2	NA	NA	NA	NA	NA
9	3	3	3	NA	NA	NA	NA	NA
10	3	3	3	1	NA	NA	NA	NA
11	3	3	3	2	NA	NA	NA	NA
12	3	3	3	3	NA	NA	NA	NA
13	3	3	3	3	1	NA	NA	NA
14	3	3	3	3	2	NA	NA	NA
15	3	3	3	3	3	NA	NA	NA
16	3	3	3	3	3	1	NA	NA
17	3	3	3	3	3	2	NA	NA
18	3	3	3	3	3	3	NA	NA
19	3	3	3	3	3	3	1	NA
20	3	3	3	3	3	3	2	NA
21	3	3	3	3	3	3	3	NA
22	3	3	3	3	3	3	3	1
23	3	3	3	3	3	3	3	2
24	3	3	3	3	3	3	3	3

The COB IDs occupied by the active PDOs are listed in the following tables. The CANopen address must be added to the COB IDs in the tables.

	RXPDO1	RXPDO2	RXPDO3	RXPDO4	RXPDO5	RXPDO6	RXPDO7	RXPDO8
COB ID	200hex	300hex	400hex	500hex	240hex	340hex	440hex	540hex
	TXPDO1	TXPDO2	TXPDO3	TXPDO4	TXPDO5	TXPDO6	TXPDO7	TXPDO8
COB ID	180hex	280hex	380hex	480hex	1C0hex	2C0hex	3C0hex	4C0hex

Important: If RX PDO 5 ... 8 or TX PDO 5 ... 8 are used, there must not be a participant in the CANopen network with a node number equal to the node number of the UFO + 64.

7.4 Autosetup

The AS DIP switch activates Autosetup (see Sec. "Installation and Operation without a PC" / "Autosetup") when it is switched from 0 to 1.

7.5 DIP switch F1

Currently, DIP switch F1 does not have a function assigned to it.

8 Using the Interface

How to get online

Following the "Update" function in the MOVITOOLS Manager, all participants detected on the system bus – inverters and gateways – are displayed. The gateway gives users access to Status, Shell, Assembler and Compiler at all connected inverters.

MT Gateway supports project planning and startup of a UFO fieldbus node.

The bus configuration can either be planned offline or downloaded from the UFO online and edited.

Before starting an MT Gateway session, it is a good idea to check that the hardware Autosetup is switched off (DIP switch 8 set to off).

Before startup, make sure that there is no risk of injury to people or damage to property if a bus error does occur (on the fieldbus or system bus).

Project planning / startup

Two modes are available for project planning/startup.

Autoconfiguration mode operates similarly to the hardware Autosetup. It works through the participants one after the other starting from the lowest system bus address and assigns 3 process output data items and 3 process input data items to each participant.

Example

Autoconfiguration: 3 participants with addresses 10, 11 and 12 => 9 PDs

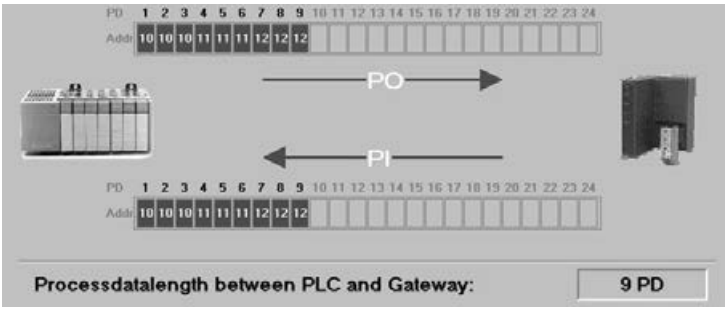


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Fig. 12: Example of autoconfiguration

Process data assignment can be freely configured in expert mode ("Extras" menu). Assignment is graphical to some extent (drag & drop).

Example

Participant 10, PO1 is configured

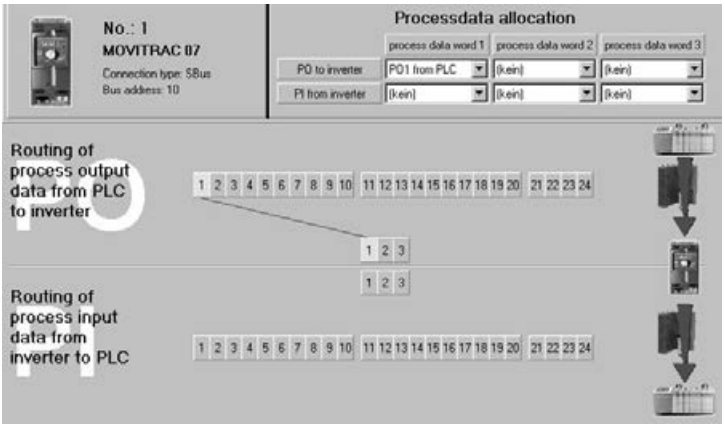

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Fig. 13: Participant 10, PO1 is configured

Packing/bundling the process output data can look like this: PO1 ... PO3 are received by all 3 participants (e.g. control word 1, speed setpoint, ramp).

The master receives 1 PD from each inverter as process input data (e.g. control word 2). Compared to Autosetup, this saves 6 process output words and 6 process input data words in the master.

Avoid multiple assignment of process input data since it makes no sense.

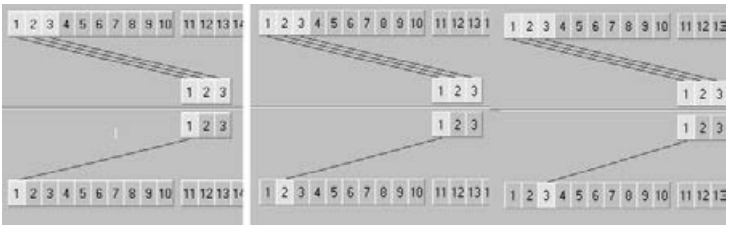

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Fig. 14: Multiple assignment

A CANopen telegram can contain up to 4 process data words (PO or PI). Consequently, also pay attention to the assignment of individual telegrams during configuration. As a result, PO1, PO2 and PO3 are transferred in one telegram in the Autosetup and PO4, PO5 and PO6 in a second one.

9 Object List

Index	Subindex	Function	Data type	Default	Access
0x1000	0	device type	UNSIGNED32	0	ro
0x1001	0	error register	UNSIGNED8	-	ro
0x1002	0	manufacturer status register	UNSIGNED32	-	ro
0x1004	0	Number of PDOs supported	UNSIGNED32	(See Sec. 7.3)	ro
	1	Number of syn. PDOs supported	UNSIGNED32	(See Sec. 4.1)	ro
	2	Number of asy. PDOs supported	UNSIGNED32	(--- " ---)	ro
0x1005	0	Sync COB ID	UNSIGNED32	0x80	rw
0x1008	0	manufacturer device name	VISI.STRING	UFO11A	ro
0x1009	0	manufacturer hardware version	VISI.STRING	8237328.XX	ro
0x100A	0	manufacturer software version	VISI.STRING	8243727.XX	ro
0x100B	0	node ID	UNSIGNED32	(See Sec. 7.1)	ro
0x100C	0	guard time	UNSIGNED16	0	rw
0x100D	0	lifetime factor	UNSIGNED8	0	rw
0x100E	0	COB ID nodeguarding	UNSIGNED32	= 0x700+NodeId	ro
0x100F	0	number of SDOs supported	UNSIGNED32	1	ro
0x1014	0	Emergency COB ID	UNSIGNED32	= 0x080+NodeId	rw
0x1015	0	Emergency inhibit time	UNSIGNED16	0	rw
0x1016	0	Consumer heartbeat time	UNSIGNED8	0	ro
	1	Node ID + heartbeat time	UNSIGNED32	0	rw
0x1017	0	Heartbeat producer time	UNSIGNED16	0	rw
0x1018	0	Identity object length	UNSIGNED8	1	ro
	1	Identity	UNSIGNED32	0x59	ro
0x1200	0	SDO server parameter	UNSIGNED8	2	ro
	1	COB ID client->server (RxSDO)	UNSIGNED32	= 0x600+NodeId	ro
	2	COB ID server->client (TxSDO)	UNSIGNED32	= 0x580+NodeId	ro
0x1400	0	RX PDO1 communication parameter	UNSIGNED8	2	ro
	1	COB ID	UNSIGNED32	(See Sec. 7.3)	rw
	2	transmission type	UNSIGNED8	1	rw
0x1401	0	RX PDO2 communication parameter	UNSIGNED8	2	ro
	1	COB ID	UNSIGNED32	-	rw
	2	transmission type	UNSIGNED8	1	rw
0x1402	0	RX PDO3 communication parameter	UNSIGNED8	2	ro
	1	COB ID	UNSIGNED32	-	rw
	2	transmission type	UNSIGNED8	1	rw
0x1403	0	RX PDO4 communication parameter	UNSIGNED8	2	ro
	1	COB ID	UNSIGNED32	-	rw
	2	transmission type	UNSIGNED8	1	rw
0x1404	0	RX PDO5 communication parameter	UNSIGNED8	2	ro
	1	COB ID	UNSIGNED32	-	rw
	2	transmission type	UNSIGNED8	1	rw
0x1405	0	RX PDO6 communication parameter	UNSIGNED8	2	ro
	1	COB ID	UNSIGNED32	-	rw
	2	transmission type	UNSIGNED8	1	rw
0x1406	0	RX PDO7 communication parameter	UNSIGNED8	2	ro
	1	COB ID	UNSIGNED32	-	rw
	2	transmission type	UNSIGNED8	1	rw
0x1407	0	RX PDO8 communication parameter	UNSIGNED8	2	ro
	1	COB ID	UNSIGNED32	-	rw
	2	transmission type	UNSIGNED8	1	rw

Index	Subindex	Function	Data type	Default	Access
0x1600	0	RX PDO1 mapping parameter	UNSIGNED8	(See Sec. 4.1)	rw
	1	first mapped object	UNSIGNED32	-	ro
	2	second mapped object	UNSIGNED32	-	ro
	3	third mapped object	UNSIGNED32	-	ro
	4	fourth mapped object	UNSIGNED32	-	ro
0x1601	0	RX PDO2 mapping parameter	UNSIGNED8	-	rw
	1	first mapped object	UNSIGNED32	-	ro
	2	second mapped object	UNSIGNED32	-	ro
	3	third mapped object	UNSIGNED32	-	ro
	4	fourth mapped object	UNSIGNED32	-	ro
0x1602	0	RX PDO2 mapping parameter	UNSIGNED8	-	ro
	1	first mapped object	UNSIGNED32	-	ro
	2	second mapped object	UNSIGNED32	-	ro
	3	third mapped object	UNSIGNED32	-	ro
	4	fourth mapped object	UNSIGNED32	-	ro
0x1603	0	RX PDO3 mapping parameter	UNSIGNED8	-	rw
	1	first mapped object	UNSIGNED32	-	ro
	2	second mapped object	UNSIGNED32	-	ro
	3	third mapped object	UNSIGNED32	-	ro
	4	fourth mapped object	UNSIGNED32	-	ro
0x1604	0	RX PDO4 mapping parameter	UNSIGNED8	-	rw
	1	first mapped object	UNSIGNED32	-	ro
	2	second mapped object	UNSIGNED32	-	ro
	3	third mapped object	UNSIGNED32	-	ro
	4	fourth mapped object	UNSIGNED32	-	ro
0x1605	0	RX PDO5 mapping parameter	UNSIGNED8	-	rw
	1	first mapped object	UNSIGNED32	-	ro
	2	second mapped object	UNSIGNED32	-	ro
	3	third mapped object	UNSIGNED32	-	ro
	4	fourth mapped object	UNSIGNED32	-	ro
0x1606	0	RX PDO6 mapping parameter	UNSIGNED8	-	rw
	1	first mapped object	UNSIGNED32	-	ro
	2	second mapped object	UNSIGNED32	-	ro
	3	third mapped object	UNSIGNED32	-	ro
	4	fourth mapped object	UNSIGNED32	-	ro
0x1607	0	RX PDO7 mapping parameter	UNSIGNED8	-	rw
	1	first mapped object	UNSIGNED32	-	ro
	2	second mapped object	UNSIGNED32	-	ro
	3	third mapped object	UNSIGNED32	-	ro
	4	fourth mapped object	UNSIGNED32	-	ro
0x1800	0	TX PDO1 communication parameter	UNSIGNED8	3	ro
	1	COB ID	UNSIGNED32	-	rw
	2	transmission type	UNSIGNED8	1	rw
	3	inhibit time	UNSIGNED16	0	rw
0x1801	0	TX PDO2 communication parameter	UNSIGNED8	3	ro
	1	COB ID	UNSIGNED32	-	rw
	2	transmission type	UNSIGNED8	1	rw
	3	inhibit time	UNSIGNED16	0	rw
0x1802	0	TX PDO3 communication parameter	UNSIGNED8	3	ro
	1	COB ID	UNSIGNED32	-	rw
	2	transmission type	UNSIGNED8	1	rw
	3	inhibit time	UNSIGNED16	0	rw

Index	Subindex	Function	Data type	Default	Access
0x1803	0	TX PDO4 communication parameter	UNSIGNED8	3	ro
	1	COB ID	UNSIGNED32	-	rw
	2	transmission type	UNSIGNED8	1	rw
	3	inhibit time	UNSIGNED16	0	rw
0x1804	0	TX PDO5 communication parameter	UNSIGNED8	3	ro
	1	COB ID	UNSIGNED32	-	rw
	2	transmission type	UNSIGNED8	1	rw
	3	inhibit time	UNSIGNED16	0	rw
0x1805	0	TX PDO6 communication parameter	UNSIGNED8	3	ro
	1	COB ID	UNSIGNED32	-	rw
	2	transmission type	UNSIGNED8	1	rw
	3	inhibit time	UNSIGNED16	0	rw
0x1806	0	TX PDO7 communication parameter	UNSIGNED8	3	ro
	1	COB ID	UNSIGNED32	-	rw
	2	transmission type	UNSIGNED8	1	rw
	3	inhibit time	UNSIGNED16	0	rw
0x1807	0	TX PDO8 communication parameter	UNSIGNED8	3	ro
	1	COB ID	UNSIGNED32	-	rw
	2	transmission type	UNSIGNED8	1	rw
	3	inhibit time	UNSIGNED16	0	rw
0x1A00	0	TX PDO1 mapping parameter	UNSIGNED8	-	rw
	1	first mapped object	UNSIGNED32	-	ro
	2	second mapped object	UNSIGNED32	-	ro
	3	third mapped object	UNSIGNED32	-	ro
	4	fourth mapped object	UNSIGNED32	-	ro
0x1A01	0	TX PDO2 mapping parameter	UNSIGNED8	-	rw
	1	first mapped object	UNSIGNED32	-	ro
	2	second mapped object	UNSIGNED32	-	ro
	3	third mapped object	UNSIGNED32	-	ro
	4	fourth mapped object	UNSIGNED32	-	ro
0x1A02	0	TX PDO3 mapping parameter	UNSIGNED8	-	rw
	1	first mapped object	UNSIGNED32	-	ro
	2	second mapped object	UNSIGNED32	-	ro
	3	third mapped object	UNSIGNED32	-	ro
	4	fourth mapped object	UNSIGNED32	-	ro
0x1A03	0	TX PDO4 mapping parameter	UNSIGNED8	-	rw
	1	first mapped object	UNSIGNED32	-	ro
	2	second mapped object	UNSIGNED32	-	ro
	3	third mapped object	UNSIGNED32	-	ro
	4	fourth mapped object	UNSIGNED32	-	ro
0x1A04	0	TX PDO5 mapping parameter	UNSIGNED8	-	rw
	1	first mapped object	UNSIGNED32	-	ro
	2	second mapped object	UNSIGNED32	-	ro
	3	third mapped object	UNSIGNED32	-	ro
	4	fourth mapped object	UNSIGNED32	-	ro
0x1A05	0	TX PDO6 mapping parameter	UNSIGNED8	-	rw
	1	first mapped object	UNSIGNED32	-	ro
	2	second mapped object	UNSIGNED32	-	ro
	3	third mapped object	UNSIGNED32	-	ro
	4	fourth mapped object	UNSIGNED32	-	ro
0x1A06	0	TX PDO7 mapping parameter	UNSIGNED8	-	rw
	1	first mapped object	UNSIGNED32	-	ro
	2	second mapped object	UNSIGNED32	-	ro
	3	third mapped object	UNSIGNED32	-	ro
	4	fourth mapped object	UNSIGNED32	-	ro

Index	Subindex	Function	Data type	Default	Access
0x1A07	0	TX PDO8 mapping parameter	UNSIGNED8	-	rw
	1	first mapped object	UNSIGNED32	-	ro
	2	second mapped object	UNSIGNED32	-	ro
	3	third mapped object	UNSIGNED32	-	ro
	4	fourth mapped object	UNSIGNED32	-	ro
0x206c ... 0x5fff	0 ... 63	Unit-specific objects, see Fieldbus Unit Profile	UNSIGNED32	See "Parameter access via SDOs"	rw
0x3db8	0	PO data buffer, word 0	UNSIGNED32	0	ro
0x3db9	0	PO data buffer, word 1	UNSIGNED32	0	ro
0x3dba	0	PO data buffer, word 2	UNSIGNED32	0	ro
0x3dbb	0	PO data buffer, word 3	UNSIGNED32	0	ro
0x3dbc	0	PO data buffer, word 4	UNSIGNED32	0	ro
0x3dbd	0	PO data buffer, word 5	UNSIGNED32	0	ro
0x3dbe	0	PO data buffer, word 6	UNSIGNED32	0	ro
0x3dbf	0	PO data buffer, word 7	UNSIGNED32	0	ro
0x3dc0	0	PO data buffer, word 8	UNSIGNED32	0	ro
0x3dc1	0	PO data buffer, word 9	UNSIGNED32	0	ro
0x3dc2	0	PO data buffer, word 10	UNSIGNED32	0	ro
0x3dc3	0	PO data buffer, word 11	UNSIGNED32	0	ro
0x3dc4	0	PO data buffer, word 12	UNSIGNED32	0	ro
0x3dc5	0	PO data buffer, word 13	UNSIGNED32	0	ro
0x3dc6	0	PO data buffer, word 14	UNSIGNED32	0	ro
0x3dc7	0	PO data buffer, word 15	UNSIGNED32	0	ro
0x3dc8	0	PO data buffer, word 16	UNSIGNED32	0	ro
0x3dc9	0	PO data buffer, word 17	UNSIGNED32	0	ro
0x3dca	0	PO data buffer, word 18	UNSIGNED32	0	ro
0x3dcb	0	PO data buffer, word 19	UNSIGNED32	0	ro
0x3dcc	0	PO data buffer, word 20	UNSIGNED32	0	ro
0x3dcd	0	PO data buffer, word 21	UNSIGNED32	0	ro
0x3dce	0	PO data buffer, word 22	UNSIGNED32	0	ro
0x3dcf	0	PO data buffer, word 23	UNSIGNED32	0	ro
0x3dd0	0	PO data buffer, word 24	UNSIGNED32	0	ro
0x3e1c	0	PI data buffer, word 0	UNSIGNED32	0	ro
0x3e1d	0	PI data buffer, word 1	UNSIGNED32	0	ro
0x3e1e	0	PI data buffer, word 2	UNSIGNED32	0	ro
0x3e1f	0	PI data buffer, word 3	UNSIGNED32	0	ro
0x3e20	0	PI data buffer, word 4	UNSIGNED32	0	ro
0x3e21	0	PI data buffer, word 5	UNSIGNED32	0	ro
0x3e22	0	PI data buffer, word 6	UNSIGNED32	0	ro
0x3e23	0	PI data buffer, word 7	UNSIGNED32	0	ro
0x3e24	0	PI data buffer, word 8	UNSIGNED32	0	ro
0x3e25	0	PI data buffer, word 9	UNSIGNED32	0	ro
0x3e26	0	PI data buffer, word 10	UNSIGNED32	0	ro
0x3e27	0	PI data buffer, word 11	UNSIGNED32	0	ro
0x3e28	0	PI data buffer, word 12	UNSIGNED32	0	ro
0x3e29	0	PI data buffer, word 13	UNSIGNED32	0	ro
0x3e2a	0	PI data buffer, word 14	UNSIGNED32	0	ro
0x3e2b	0	PI data buffer, word 15	UNSIGNED32	0	ro
0x3e2c	0	PI data buffer, word 16	UNSIGNED32	0	ro
0x3e2d	0	PI data buffer, word 17	UNSIGNED32	0	ro
0x3e2e	0	PI data buffer, word 18	UNSIGNED32	0	ro
0x3e2f	0	PI data buffer, word 19	UNSIGNED32	0	ro
0x3e30	0	PI data buffer, word 20	UNSIGNED32	0	ro
0x3e31	0	PI data buffer, word 21	UNSIGNED32	0	ro
0x3e32	0	PI data buffer, word 22	UNSIGNED32	0	ro

Index	Subindex	Function	Data type	Default	Access
0x3e33	0	PI data buffer, word 23	UNSIGNED32	0	ro
0x3e34	0	PI data buffer, word 24	UNSIGNED32	0	ro

10 Parameter List

Par. no.	Parameter	Index	Unit	Access	Default	Meaning / value range
010	Unit status	8310		RO	0	
011	Operational status	8310		RO	0	
012	Fault status	8310		RO	0	
013	Active parameter set	8310		RO	0	
015	Mains ON operation time	8328	s	RO/N	0	
070	Unit type	8301		RO	0	
076	Firmware basic unit	8300		RO	0	
090	PD configuration	8451		RO	4	
091	Fieldbus type	8452		RO	2	
092	Fieldbus baud rate	8453		RO	0	
093	Fieldbus address	8454		RO	0	
094	PO1 setpoint	8455		RO	0	
095	PO2 setpoint	8456		RO	0	
096	PO3 setpoint	8457		RO	0	
097	PI1 actual value	8458		RO	0	
098	PI2 actual value	8459		RO	0	
099	PI3 actual value	8460		RO	0	
802	Factory setting	8594		R/RW	0	0: NO 1: YES 2: DELIVERY CONDITION
810	RS485 address	8597		R0	0	
812	RS485 timeout delay	8599	s	R/RW	1	
816	SBus baud rate	8603		R/RW	0	0: 125 kbaud 1: 250 kbaud 2: 500 kbaud 3: 1000 kbaud
819	Fieldbus timeout delay	8606	s	RO	0.630	
831	RESPONSE fieldbus timeout	8610		R/RW	10	0: NO RESPONSE 10: PO DATA = 0 / WARN
840	Manual reset	8617		R/RW		
870	Setpoint description PO1	8304		RO	12	IPOS PO-DATA
871	Setpoint description PO2	8305		RO	12	IPOS PO-DATA
872	Setpoint description PO3	8306		RO	12	IPOS PO-DATA
873	Actual value description PI1	8307		RO	9	IPOS PI-DATA
874	Actual value description PI2	8308		RO	9	IPOS PI-DATA
875	Actual value description PI3	8309		RO	9	IPOS PI-DATA

11 List of Errors

Fault code	Name	Response	Cause	Action
10	IPOS ILLOP	IPOS program stop	Error in IPOS program	Use the UFX Configurator to reconfigure the interface
17	Stack overflow	SBus communication stopped	Inverter electronics disrupted, possibly due to effect of EMC	Check ground connections and shields; improve them if necessary. Contact SEW Service for advice if this reoccurs.
18	Stack underflow	SBus communication stopped	"	"
19	NMI	SBus communication stopped	"	"
20	Undefined opcode	SBus communication stopped	"	"
21	Protection fault	SBus communication stopped	"	"
22	Illegal word operand access	SBus communication stopped	"	"
23	Illegal instruction access	SBus communication stopped	"	"
24	Illegal external bus access	SBus communication stopped	"	"
25	EEPROM	SBus communication stopped	Fault when accessing EEPROM	Call up default setting, perform reset and set UFO parameters again. Contact SEW Service for advice if this reoccurs.
28	Fieldbus timeout	Connected inverters stopped (control word = 0)	No master-slave communication took place within the configured response monitoring period.	• Check master communication routine • Extend the fieldbus timeout delay (response monitoring) in the master configuration or switch off monitoring
32	IPOS index overrun	IPOS program stop	Basic programming rules violated causing stack overflow in system.	Check IPOS user program and correct if necessary
37	Watchdog fault	SBus communication stopped	Fault in system software procedure	Check ground connections and shields; improve them if necessary. Contact SEW Service for advice if this reoccurs.
45	Initialization fault	SBus communication stopped	Fault after self-test in reset	Check DIP switches F1 and F2; they must be off. Perform reset. Contact SEW Service for advice if this reoccurs.
77	Invalid IPOS control word	IPOS program stop	Attempt was made to set an invalid automatic mode (via external control).	Check write values of external control
91	System fault	None	Please check the red SYS-FLT LED on the UFO. If this LED is on, then one or more stations on the SBus could not be addressed within the timeout period. If the red SYS-FLT LED is flashing, then the UFO itself is in fault status. Fault 91 was then only signaled to the control via the fieldbus.	Check the voltage supply and the SBus cabling, check the SBus terminating resistors. Check the configuration if the UFO was configured with the PC. Switch the UFO off and on again. Query the fault using the diagnostic interface if the fault remains, and take the action described in this table.

12 Technical Data

	Part number:	824 096 5
	Startup tools:	MOVITOOLS from V 2.70 onwards
	Voltage supply:	24 V_{DC} (18 ... 30 V_{DC}), external supply
	Current consumption at 24 V_{DC}:	110 mA
	Setting parameters	Autoconfiguration and/or MOVITOOLS
	Diagnosis:	LEDs on front of unit / MOVITOOLS
	Mounting:	Screw mounting or support rail
	Ambient temperature:	-10 °C ... +50 °C
SBus	Transmission speed:	max. 1 Mbaud
	Transfer protocol:	MOVILINK
	Number of units on SBus:	max. 8
	Process data words per unit:	max. 3 PDs
	Connection system:	Disconnectable screw terminals
	Electrical isolation:	Yes: From CANopen supply voltage
	Terminating resistor:	Always active
CANopen	Transmission speeds:	1 Mbaud / 500 kbaud / 250 kbaud / 125 kbaud
	CANopen profile:	DS301 V4.0
	Number of PDOs:	max. 8 RX PDO + 8 TX PDO
	Connection system:	Disconnectable screw terminals
	Electrical isolation:	Yes: From SBus
	Terminating resistor:	External (e.g. also on the screw terminals)
	EDS file:	sew-eurodrive web site
Parameter setting and diagnostic interface	Type:	RS-485
	Connection system:	RJ11 (for connection to UWS21A)
	Necessary software:	MOVITOOLS from V2.70 onwards
	Electrical isolation:	Yes: From SBus and via UWS21A

13 Dimensions

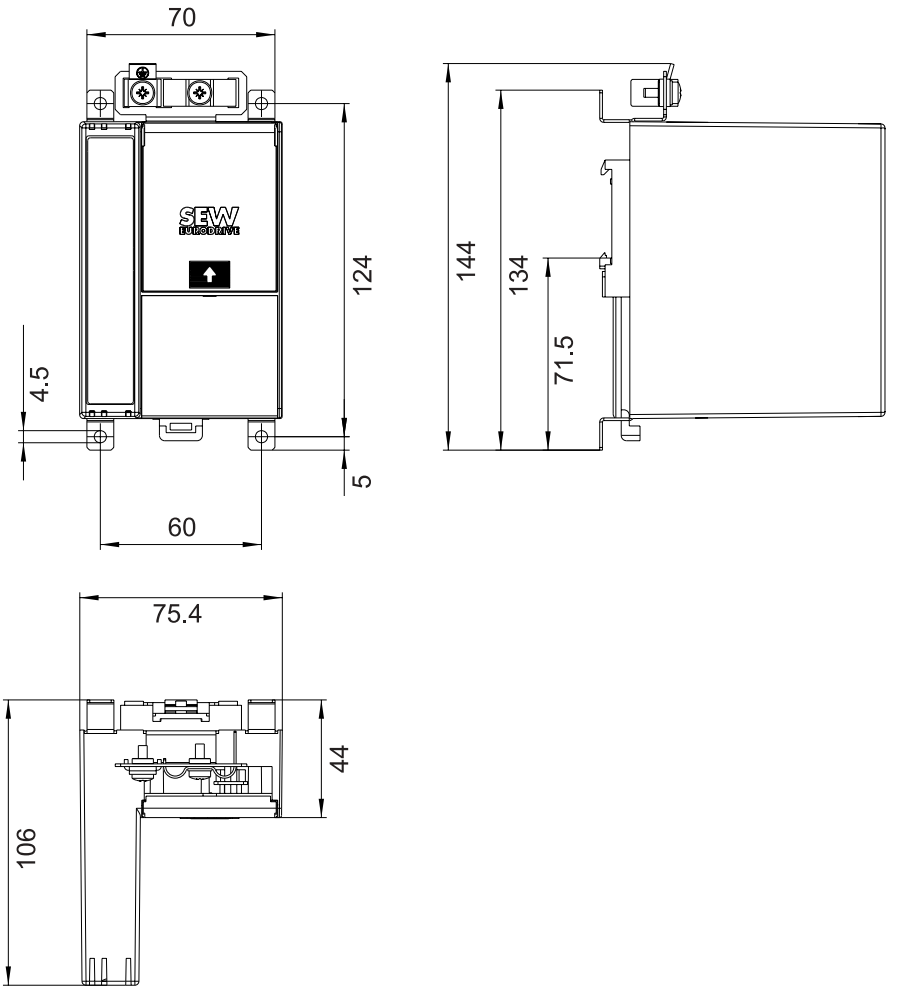

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Fig. 15: Dimensions

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